REMARKS

This preliminary amendment is made to put the application in better condition for examination.

Claims 10, 15-17, 21-35, 41, 50, 52-53 and 55 have been amended. No claims have been cancelled. Claims 56-63 are newly presented. No new matter has been added. A Version with Markings to Show Changes is attached.

CONCLUSION

It is submitted that the present application is in form for allowance, and such action is respectfully requested.

The Commissioner is authorized to charge any additional fees which may be required, including petition fees and extension of time fees, to Deposit Account No. 08-1641 (Docket No. 18120-0231). Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES

10. (Amended) The filter of claim 9, further comprising:

a modulator coupled to the optical bandpass filter[and the coupler setup in claim 8] to receive the optical carrier, a modulating signal is applied to the electrodes of the modulator modulating the carrier to form a modulated optical carrier.

15. (Amended) An interleaved optical single sideband communications system comprising:

[a Mach-Zehnder] <u>an optical</u> modulator, constructed and arranged to accept an incoming optical carrier and including:

a splitter which splits the incoming optical signal into a first optical carrier and a second optical carrier;

a first AC phase modulator to apply a first electrical signal carrying a plurality of first channels to modulate the first optical signal;

a second AC phase modulator to apply a second electrical signal carrying a plurality of second channels to modulate the second optical signal, each first channel corresponding to one of the second channels, and each first channel being phase shifted 90° relative to each corresponding second channel;

a first DC phase modulator to modulate the first optical signal;

a second DC phase modulator to modulate the second optical signal, the first and second DC phase modulators constructed and arranged to modulate an optical carrier component of the first optical signal to be phase shifted 90° relative to an optical carrier component of the second optical signal, the optical carrier component of the second optical signal having a frequency

substantially equal to the optical carrier component of the first optical signal;

a directional coupler that coupled to the [Mach-Zehnder] optical modulator and combines the modulated first and second optical signals to form a combined optical signal having an optical carrier component, such that alternate channels of the combined optical signal are substantially cancelled; and

wherein the [Mach-Zehnder] optical modulator creating a plurality of first single [side band] side bands on a side of the optical carrier frequency, a plurality of first residual [image] images on the opposite side of the optical carrier frequency, a plurality of second [side band] side bands on a side of the optical carrier frequency, and a plurality of second residual [image] images on the opposite side of the optical carrier frequency..

16. (Amended) The system of claim 15, wherein frequencies of the plurality of first side [band] bands is offset from the plurality of second residual images, and frequencies of the plurality of second side [band] bands is offset from the first residual images.

17. (Amended) The system of claim 15, further comprising: an optical carrier notch filter coupled to the [Mach-Zehnder] optical modulator.

21. (Amended) An interleaved optical single sideband communications system comprising:

[a Mach-Zehnder] an optical modulator, constructed and arranged to accept an incoming optical carrier, the {Mach-Zehnder] optical modulator comprising:

a splitter which splits the incoming optical signal into a first optical carrier and a second optical carrier;

a first AC phase modulator to apply a first electrical signal carrying a plurality of first channels to modulate the first optical signal;

a second AC phase modulator to apply a second electrical signal carrying a plurality of second channels to modulate the second optical signal, each first channel corresponding to one of the second channels, and each first channel being phase shifted 90° relative to each corresponding second channel;

a first DC phase modulator to modulate the first optical signal;

a second DC phase modulator to modulate the second optical signal, the first and second DC phase modulators constructed and arranged to modulate an optical carrier component of the first optical signal to be phase shifted 90° relative to an optical carrier component of the second optical signal, the optical carrier component of the second optical signal having a frequency substantially equal to the optical carrier component of the first optical signal;

a combiner which combines the modulated first and second optical signals to form a combined optical signal having an optical carrier component, such that alternate channels of the combined optical signal are substantially cancelled; and

a notch filter coupled to the [Mach-Zehnder] <u>optical</u> modulator, the notch filter including, an optical coupler including at least a first, a second and a third port, the first port being configured to receive an output that includes an optical carrier and interleaved optical single sideband signals, and an optical bandpass filter coupled to a second port of the optical coupler, the optical bandpass filter separating the output into a transmitted signal that contains the optical carrier and a reflected signal that includes the interleaved optical single sideband signals that are reflected from the optical bandpass filter to the third port of the optical coupler.

22. (Amended) The system of claim 21, wherein the [Mach-Zehnder] <u>optical</u> modulator creates a first single side band on a side of the optical carrier frequency with a first residual image on the opposite side of the optical carrier frequency, a second side band on a side of the optical carrier frequency with a second residual image on the opposite side of the optical carrier frequency; and a frequency of the first side band is offset from the residual image and harmonics of the second sideband, and a frequency of the second side band is offset from the residual image and harmonics of the first sideband.

23. (Amended) An interleaved optical single sideband communications system comprising:

[a Mach-Zehnder] <u>an optical</u> modulator, constructed and arranged to accept an incoming optical carrier, the [Mach-Zehnder] <u>optical</u> modulator comprising:

a splitter which splits the incoming optical signal into a first optical carrier and a second optical carrier;

a first AC phase modulator to apply a first electrical signal carrying a plurality of first channels to modulate the first optical signal;

a second AC phase modulator to apply a second electrical signal carrying a plurality of second channels to modulate the second optical signal, each first channel corresponding to one of the second channels, and each first channel being phase shifted 90° relative to each corresponding second channel;

a first DC phase modulator to modulate the first optical signal;

a second DC phase modulator to modulate the second optical signal, the first and second DC phase modulators constructed and arranged to modulate an optical carrier component of the first

optical signal to be phase shifted 90° relative to an optical carrier component of the second optical signal, the optical carrier component of the second optical signal having a frequency substantially equal to the optical carrier component of the first optical signal;

a combiner which combines the modulated first and second optical signals to form a combined optical signal having an optical carrier component, such that alternate channels of the combined optical signal are substantially cancelled; and

a notch filter coupled to the [Mach-Zehnder] <u>optical</u> modulator, the notch filter including, an optical coupler including at least a first, a second and a third port, the first port being configured to receive an output that includes an optical carrier and interleaved optical single sideband signals, and an optical bandpass filter coupled to a second port of the optical coupler, the optical bandpass filter separating the output into a reflected signal that contains the optical carrier and a transmitted signal that includes the interleaved optical single sideband signals that are transmitted through the optical bandpass filter.

24. (Amended) An interleaved optical single sideband communications system comprising:

[a Mach-Zehnder] <u>an optical</u> modulator, constructed and arranged to accept an incoming optical carrier, the [Mach-Zehnder] <u>optical</u> modulator comprising:

a splitter which splits the incoming optical signal into a first optical carrier and a second optical carrier;

a first AC phase modulator to apply a first electrical signal carrying a plurality of first channels to modulate the first optical signal;

a second AC phase modulator to apply a second electrical signal carrying a plurality of second channels to modulate the

second optical signal, each first channel corresponding to one of the second channels, and each first channel being phase shifted 90° relative to each corresponding second channel;

a first DC phase modulator to modulate the first optical signal;

a second DC phase modulator to modulate the second optical signal, the first and second DC phase modulators constructed and arranged to modulate an optical carrier component of the first optical signal to be phase shifted 90° relative to an optical carrier component of the second optical signal, the optical carrier component of the second optical signal having a frequency substantially equal to the optical carrier component of the first optical signal;

a combiner which combines the modulated first and second optical signals to form a combined optical signal having an optical carrier component, such that alternate channels of the combined optical signal are substantially cancelled; and

wherein the [Mach-Zehnder] optical modulator creates a first single side band on a side of the optical carrier frequency with a first residual image on a side of the optical carrier frequency, a second side band on a side of the optical carrier frequency with a second residual image on a side of the optical carrier frequency; and a frequency of the first side band is offset from the second residual image, and a frequency of the second side band is offset from the first residual image.

25. (Amended) [An] The interleaved optical single sideband communications system according to claim 24, further comprising:

an input polarization controller, constructed and arranged to control a polarization of the incoming optical signal;

a polarization maintaining input optical fiber, constructed and arranged to accept the incoming optical signal from the input

polarization controller and to provide the incoming optical signal to the modulator.

26. (Amended) [An] The interleaved optical single sideband communications system according to claim 24, further comprising:

a light emitting device, constructed and arranged to produce the incoming optical carrier and inject the incoming optical carrier into the modulator;

a notch filter, disposed after the modulator, the notch filter filtering a range of wavelengths including a wavelength of the optical carrier component of the combined optical signal;

a dispersion compensation device, disposed after the notch filter.

27. (Amended) [An] The interleaved optical single sideband communications system according to claim 26, wherein an amplifier is disposed after the fiber dispersion compensation device.

29. (Amended) [An] The interleaved optical single sideband communications system according to claim 26, wherein the dispersion compensation device is a device selected from the group consisting of: a length of dispersion compensating fiber and a chirped fiber Bragg grating.

30. (Amended) [An] The interleaved optical single sideband communications system according to claim 24, further comprising an optical receiver receiving the combined optical signal, the optical receiver comprising:

an optical filter, constructed and arranged to pass a range of frequencies corresponding to a selected channel of the combined optical signal; and

an optical receiver, receiving the selected channel.

31. (Amended) [An] The interleaved optical single sideband communications system according to claim 30, wherein the optical filter further comprises a tunable narrowband optical filter, tunable among a plurality of ranges of frequencies corresponding to channels carried in the combined optical signal.

32. (Amended) [An] The interleaved optical single sideband communications system according to claim 31, wherein the tunable narrowband optical filter further comprises a feedback circuit such that the filter passband can be locked on to a center (or off-center) of a channel to be passed through the filter.

33. (Amended) [An] The interleaved optical single sideband communications system according to claim 30, wherein the optical filter further comprises a plurality of fixed narrowband optical filters, each corresponding to a range of frequencies corresponding to a single channel carried in the combined optical signal,

and the optical receiver further comprises a plurality of optical receivers each of which is disposed after a corresponding one of the fixed narrowband optical filters to receive a single channel therefrom.

34. (Amended) [An] The interleaved optical single sideband communications system according to claim 24, further comprising:

a wideband optical receiver; and

a plurality of demodulators, each demodulator constructed and arranged to extract a range of frequencies from the combined optical signal corresponding to a single channel.

35. (Amended) [An] The interleaved optical single sideband communications system according to claim 24, further comprising:

a plurality of directional couplers disposed in series before the modulator, the directional couplers combining a plurality of channels to produce a combined electrical signal from which the first and second <u>plurality of</u> electrical signals are derived.

41. (Amended) A method of modulating an optical carrier frequency in [a Mach Zehnder interferometer] <u>an optical</u> modulator that includes a first phase modulator and a second phase modulator, comprising:

splitting a power of the optical carrier frequency into a first portion and a second portion;

introducing the first portion of the carrier signal frequency to the first phase modulator and the second portion of the carrier signal frequency to the second phase modulator;

applying a first signal to the first phase modulator at a first phase and to the second phase modulator at a second phase;

creating a first single side band on a side of the optical carrier frequency, and a first residual image on a side of the optical carrier frequency;

applying a second signal to the first phase modulator at a first phase and to the second phase modulator at a second phase

creating a second side band on a side of the optical carrier frequency, and a second residual image on a side of the optical carrier frequency; and

wherein a frequency of the first side band is offset from the second residual image, and a frequency of the second side band is offset from the first residual image.

50. (Amended) The method of claim 41, wherein the second side band <u>and</u> the second residual image are on opposite sides of the carrier signal frequency.

52. (Amended) The method of claim 41, wherein the [Mach Zehnder interferometer] optical modulator is a single Mach Zehnder interferometer.

53. (Amended) A method of transmitting a plurality of channels, comprising:

providing a plurality of electrical signals[,]with adjustable powers and frequencies, each electrical signal corresponding to a channel;

producing a first and a second split signal corresponding to each of the plurality of signals, each first split signal being substantially at quadrature with a corresponding second split signal;

providing an optical carrier signal;

multiplexing the optical carrier signal with the split signals to produce a multiplexed optical signal such that alternate channels are substantially cancelled and residual images of upper side band channels do not substantially overlap channels carried on a lower side band;

interleaving the at least one multiplexed optical signal to reverse positive and negative frequencies of adjacent wavelengths are reversed.

55. (Amended) A method according to claim 53, wherein the at least one multiplexed optical signal is further combined with at least one additional multiplexed optical signal by dense wavelength division multiplexing.